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Kiersten Mishalany

Applicant:	Sunil Bharitkar, et al.
Serial No.:	09/658,010
Filed:	09/08/00
Title:	SYSTEM AND METHOD FOR VARYING LOW AUDIO FREQUENCIES INVERSELY WITH AUDIO SIGNAL LEVEL
Examiner:	Justin I. Michalski
Group Art Unit:	2644
Docket No.:	45784-00012

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

RESPONSE TO OFFICE COMMUNICATION DATED SPETEMBER 8, 2004

Sir:

In response to the Office Communication dated September 8, 2004, Applicant herewith attaches a copy of an Amendment in Response to Final Office Action Dated June 3, 2004 with respect to the above referenced patent application. The attached Amendment summarizes the telephonic interview with the Examiner on September 3, 2004.

The Commissioner is hereby authorized to charge any additional fees which may be required, or credit any overpayment to Deposit Account No. 07-1853. Should such additional fees be associated with an extension of time, applicant respectfully requests that this paper be considered a petition therefor.

Respectfully submitted,

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PATENT

I hereby certify that on September 3, 2004, which is the date I am signing this certificate, I am depositing this correspondence and all identified attachments with the United States Postal Service, first class mail, in an envelope addressed to Mail Stop: AF, Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.

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AMENDMENT IN RESPONSE TO FINAL OFFICE ACTION DATED JUNE 3, 2004

Sir:

This Amendment responds to the Final Office Action Dated June 3, 2004 pertaining to the above referenced patent application. Reconsideration of this case is respectfully requested in view of the following amendments to the case and remarks.

Amendments to the Claims are reflected in the Listing of Claims, which begins on page 2 of this paper.

Remarks/Arguments begin on page 9 of this paper.

Amendments to the Claims:

This Listing of Claims replaces all prior versions, and listings, of claims in this application.

Listing of Claims:

1. (Previously Presented) A method of providing an automatic loudness compensation circuit comprising:

receiving an input audio signal with a range of frequencies where a lower portion of the range contains a bass content;

coupling the input audio signal to a voltage detector having an output voltage;

coupling the output voltage of the voltage detector to a filter circuit for adjusting a corner frequency associated with the filter circuit such that the corner frequency is inversely related to the input audio signal for boosting the bass content of the input audio signal; and

coupling an output of the filter circuit to a power amplifier for amplifying the filter circuit output.

2. (Original) The method of claim 1 wherein the method further comprises driving an audio speaker with the amplified filter circuit output.

3. (Original) The method of claim 1 wherein the filter circuit further comprises a capacitance multiplier circuit comprising a light emitting device coupled to a light sensitive resistor.

4. (Original) The method of claim 3 wherein the capacitance multiplier circuit further comprises a low pass filter coupled to the light emitting device and the light sensitive resistor.

5. (Original) The method of claim 4 wherein the filter circuit adjusts the corner frequency of the low pass filter within an operating frequency range.

6. (Original) The method of claim 5 wherein the filter circuit adjusts the corner frequency of the low pass filter such that the corner frequency is increased when the input audio signal decreases.

7. (Original) The method of claim 3 wherein the amount boost to the bass content of the input audio signal is proportional to the corner frequency of the low pass filter.

8. (Original) The method of claim 3 wherein the amount boost to the bass content of the input audio signal is proportional to the value of the light sensitive resistor.

9. (Original) The method of claim 1 wherein the source of the input audio signal is a compact disc.

10. (Original) The method of claim 1 wherein the source of the input audio signal is a cassette.

11. (Original) The method of claim 1 wherein the source of the input audio signal is a digital video disc.

12. (Original) The method of claim 1 wherein the source of the input audio signal is a microphone.

13. (Original) The method of claim 12 wherein the output of the filter circuit and the microphone input audio signal are coupled to a summing circuit having an output signal.

14. (Original) The method of claim 13 wherein the output of the summing circuit is coupled to the power amplifier.

15. (Previously Presented) A method of providing an automatic loudness compensation circuit comprising:

receiving an input audio signal with a range of frequencies where a lower portion of the range includes a bass content;

coupling the input audio signal to a voltage detector to produce an output voltage;

coupling the output voltage of the voltage detector to a control circuit, the control circuit comprising a filter circuit;

comparing a corner frequency associated with the filter circuit to the strength of the input audio signal;

shifting the corner frequency such that the corner frequency is inversely related to the strength of the input audio signal;

coupling an output of the filter circuit to a power amplifier for amplifying the filter circuit output; and

driving an audio speaker with the amplified filter circuit output.

16. (Original) The method of claim 15, further comprising:

utilizing a capacitance multiplier circuit comprising a light emitting device coupled to a light sensitive resistor having an output signal wherein the output of the light sensitive resistor is coupled to a low pass filter for adjusting the bass content of the input audio signal.

17. (Original) The method of claim 16, further comprising:

responding to an increase in the input audio signal by energizing the light emitting device within the filter circuit to produce a light source; and

decreasing the resistance of the light sensitive resistor; and

increasing the value of the capacitor in order to shift the corner frequency such that bass boosting of the audio input signal is quickly removed.

18. (Original) The method of claim 16 further comprising:

responding to a decrease in the audio input signal by de-energizing the light emitting device within the filter circuit in order to prevent a light source;

increasing the resistance of the light sensitive resistor; and

decreasing the value of the capacitor in order to shift the corner frequency such that bass boosting of the audio input signal is slowly added.

19. (Original) The method of claim 15 wherein the amount boost to the bass content of the input audio signal is proportional to the corner frequency of the filter circuit.

20. (Original) The method of claim 16 wherein the amount boost to the bass content of the input audio signal is proportional to the value of the light sensitive resistor.

21. (Original) The method of claim 16, wherein the light sensitive resistor is an opto-coupled resistor.

22. (Currently Amended) An automatic loudness compensation circuit including a terminal coupled to an input audio signal from an external source and a signal supply having voltage sufficient to drive an output audio speaker comprising:

an R.M.S. detector for providing an R.M.S. voltage from the input audio signal with a range of frequencies where a lower portion of the range includes a bass content;

a control circuit including a filter circuit for adjusting a corner frequency associated with the filter circuit such that the corner frequency is inversely related to the input audio signal;

a power amplifier for increasing the power of the output signal from the [low pass] filter circuit; and

a terminal for providing an amplified output signal.

23. (Original) The automatic loudness compensation circuit of claim 22 wherein the control circuit provides a boost to the input audio signal containing a bass content such that the boost is proportional to the corner frequency of the filter circuit.

24. (Original) The automatic loudness compensation circuit of claim 22 wherein the filter circuit further comprises a light emitting device coupled to a light sensitive resistor having an output signal wherein the output of the light sensitive resistor is coupled to a low pass filter.

25. (Original) The automatic loudness compensation circuit of claim 24 wherein the control circuit provides a boost to the input audio signal containing a bass content such that the boost is proportional to the output of the light sensitive resistor.

26. (Previously Presented) An automatic loudness compensation circuit including a terminal coupled to an input audio signal from an external source and a signal supply having voltage sufficient to drive an output audio speaker comprising:

means for detecting an R.M.S. voltage from the audio input signal with a range of frequencies where a lower portion of the range includes a bass content;

means for adjusting a corner frequency of a filter circuit such that the corner frequency is inversely related to the audio input signal;

means for amplifying the output signal from the filter circuit; and

a terminal for providing an amplified output signal.

27. (Previously Presented) A system for obtaining a first order bass boost compensation comprising:

a terminal for receiving an audio input signal having a signal level;

a level control for determining the level of the input audio signal with a range of frequencies where a lower portion of the range includes a bass content;

an automatic loudness compensation circuit having an output signal comprising:

a power supply voltage having voltage sufficient to drive an output audio speaker;

an R.M.S. detector coupled to the power supply voltage for providing an R.M.S. voltage from the input audio signal; and

a control circuit coupled to the R.M.S. detector comprising a filter having an associated corner frequency, the control circuit for adjusting the corner frequency such that the corner frequency is inversely related to the input audio signal;

a summing circuit having an output signal coupled to the automatic loudness compensation circuit for receiving input from a microphone and summing the microphone input to the output of the automatic loudness compensation circuit;

a power amplifier coupled to the summing circuit for increasing the power of the output signal from the summing circuit; and

a terminal for providing an amplified output signal to an audio speaker.

28. (Original) The method of claim 27, wherein the audio input signal is received from a compact disc player.

29. (Original) The method of claim 27, wherein the audio input signal is received from a cassette player.

30. (Original) The method of claim 27, wherein the audio input signal is received from a digital video disc player.

31. (Previously Presented) A system for obtaining an automatic loudness compensation comprising:

a input terminal for receiving an audio input signal having a signal level with a range of frequencies where a lower portion of the range includes a bass content;

a level control coupled to the input terminal for determining the level of the input audio signal;

an automatic loudness compensation circuit having an output signal coupled to the level control comprising a filter circuit for adjusting a corner frequency associated with the filter circuit such that the corner frequency is inversely related to the audio input signal;

a summing circuit having an output signal coupled to the automatic loudness compensation circuit for receiving input from a microphone and summing the microphone input to the output of the automatic loudness compensation circuit;

a power amplifier coupled to the summing circuit for increasing the power of the output signal from the summing circuit; and

a output terminal coupled to for providing an amplified output signal to an audio speaker.

32. (Cancelled).

33. (Cancelled).

34. (Cancelled).

35. (Cancelled).

36. (Cancelled).

REMARKS

I. Preliminary Remarks

In the Final Office Action, claim 22 was objected under 35 U.S.C. Section 112, second paragraph, as being indefinite. In response, claim 22 has been amended to provide proper antecedent basis for the "filter circuit." Accordingly, Applicant respectfully submits that the objection to claim 22 under 35 U.S.C. 112, second paragraph, be withdrawn. Claims 1-31 are pending.

Applicant wishes to express his appreciation to the Examiner for September 3, 2004 telephone interview. The following remarks are in accordance with the material discussed in the telephone interview.

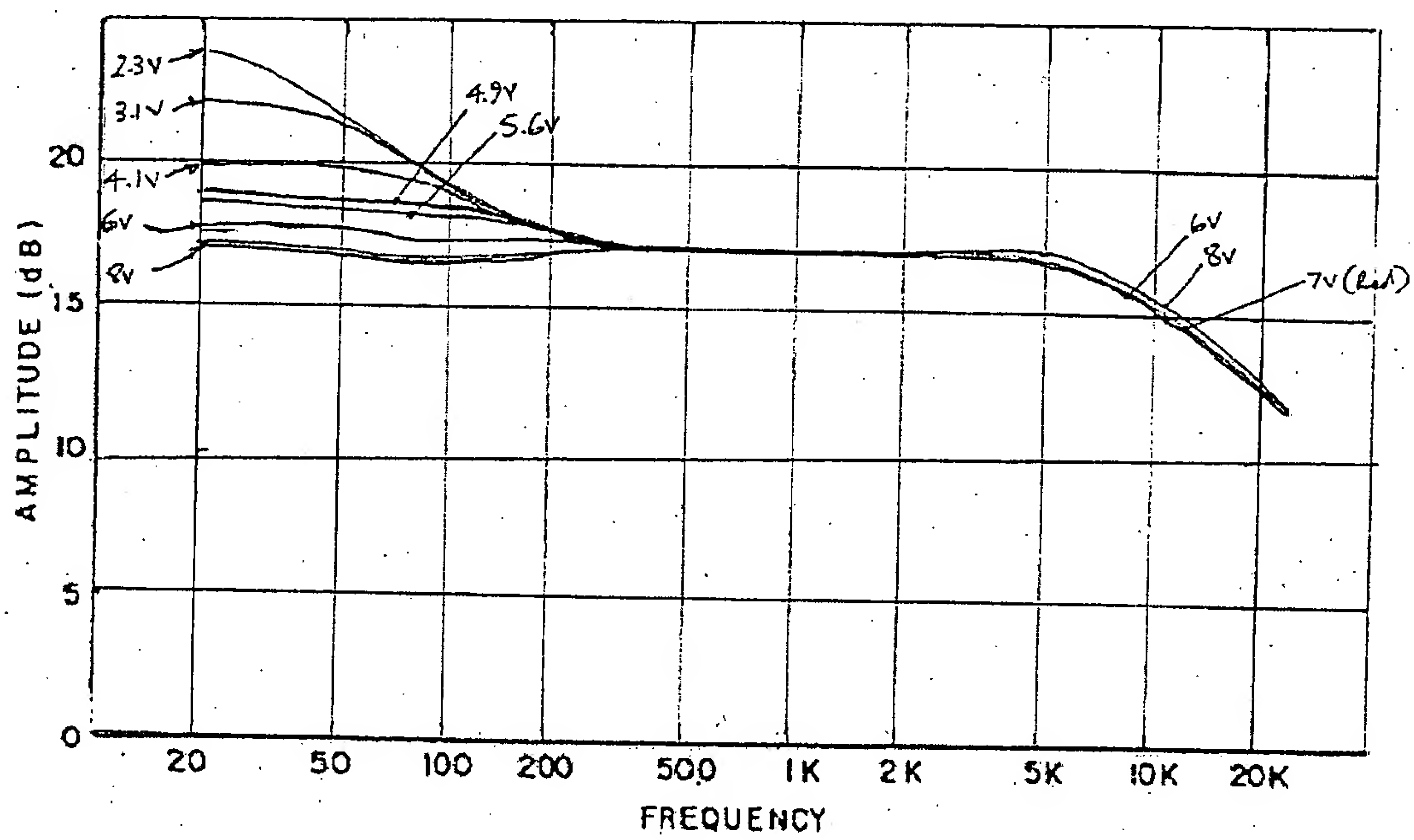
II. 102(b) Rejection based on House (U.S. Patent NO. 4,809,338)

In the Final Office Action, claims 1, 2, 9-12, 15, and 19 were rejected under 35 U.S.C. 102(b) as being anticipated by House. The Office Action indicates that Figure 3 of House discloses low frequency boosting being maximum at low frequencies and minimum at high frequencies, citing Column 5, lines 22-31, and the greater the amplitude (i.e. volume) the higher the frequency of the components of the signal appearing at the input terminal, i.e., the filter allows less low frequency components by changing the corner frequency of the circuit, citing column 5, lines 6-16.

Applicant respectfully traverses this ground of rejection for the reasons set forth below.

House is directed to audio responsiveness for an automotive vehicle, which has its unique constraints because of the small enclosed nature of the automobile along with other design constraints as discussed in column 1, lines 25-68. With such design constraints, House is directed to compensating for the frequency response characteristics as shown in Figure 3, which is different from the Flectcher-Munson characteristics. Figure 3 of House illustrates the frequency response of a system constructed according to its invention. For comparison purposes, the graph shown below represents the frequency responses for different input signals in Figure 3

of House, which have been normalized along the mid-frequency flat section. As noted in column 5, lines 22-26 of House and as shown in the graph below, for low-level signals (less than 2 v at 1 KHz), the frequency responses for all of the input signals rises (voltage levels) below about 400 Hz. In other words, the normalized graph shown below and conversely Figure 3 of House, indicate that the corner frequency is fixed at 400 Hz for all of the input signals.



(normalized graphs of Figure 3 of House)

Figure 6 of the present application is reproduced below to compare with the normalize graph of House. Figure 6 generally represent frequency responses based on the circuit of the present invention which mimics the Fletcher-Munson waveforms normalized along the mid-frequency flat section. Figure 6 indicates that for different input signals, the frequency response rise at different frequencies. In other words, in the present invention, the corner frequency is adjusted or shifted depending on the input signal. In contrast, the normalized graph of Figure 3 of House shows that the corner frequency is fixed for all of the input signals or at 400 Hz.

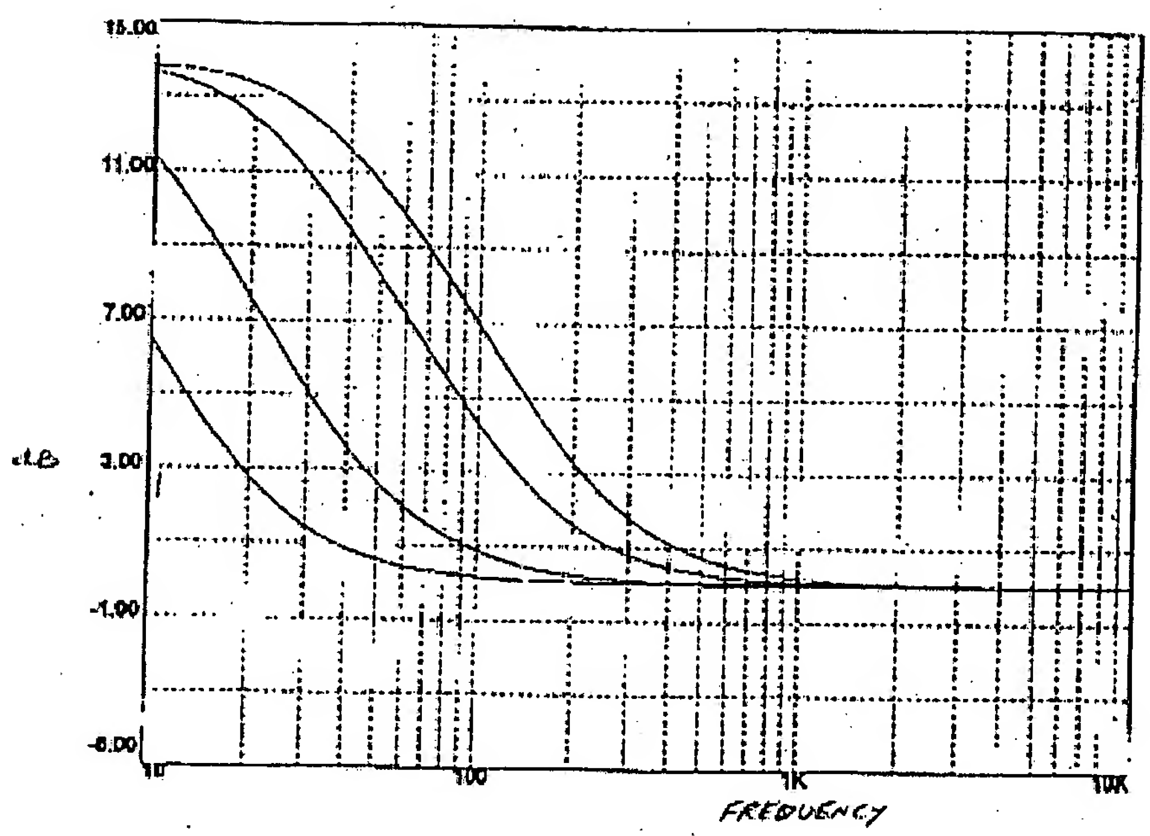


FIG. 6

As discussed above, House teaches that the corner frequency is fixed at 400 Hz for all of the voltage levels so that there is no adjusting or shifting of the corner frequency as claimed in the present invention. In this regard, each of the independent claims recites, in part, the distinguishable element:

Independent claim 1 recites, in part, "coupling the output voltage of the voltage detector to a filter circuit for adjusting a corner frequency associated with the filter circuit such that the corner frequency is inversely related to the input audio signal for boosting the bass content of the input audio signal."

Independent claim 15 recites, in part, "shifting the corner frequency such that the corner frequency is inversely related to the strength of the input audio signal."

Independent claim 22 recites, in part, "a control circuit including a filter circuit for adjusting a corner frequency associated with the filter circuit such that the corner frequency is inversely related to the input audio signal."

Independent claim 26 recites, in part, "means for adjusting a corner frequency of a filter circuit such that the corner frequency is inversely related to the audio input signal."

Independent claim 27 recites, in part, "a control circuit coupled to the R.M.S. detector comprising a filter having an associated corner frequency, the control circuit for adjusting the corner frequency such that the corner frequency is inversely related to the input audio signal."

Independent claim 31 recites, in part, "an automatic loudness compensation circuit having an output signal coupled to the level control comprising a filter circuit for adjusting a corner frequency associated with the filter circuit such that the corner frequency is inversely related to the audio input signal.".

Accordingly, all of the independent claims and their respective dependent claims are allowable over House.

III. <u>103(a) Rejections</u>:

With regard to remaining pending claims, the Final Office Action principally relies on Kimura (U.S. Patent No. 5,172,358) and House, along with other secondary references to reject the claims as being obvious under 35 U.S.C. 103(a). For the reasons set forth above in this response with regard to House and the reasons set forth in the response to the first office action dated October 2, 2003, all of the pending claims are allowable, inter alia, because none of the cited references teach or suggest adjusting or shifting the corner frequency such that the corner frequency is inversely related to the audio input signal.

In view of the foregoing, it is respectfully submitted that the claims in the application patentably distinguish over the cited and applied references and are in condition for allowance. Reexamination and reconsideration of the application, as amended, are respectfully requested.

If for any reason the Examiner finds the application other than in condition for allowance, the Examiner is respectfully requested to call Applicant's undersigned representative at (213) 689-5176 to discuss the steps necessary for placing the application in condition for allowance.

The Commissioner is hereby authorized to charge any additional fees which may be required, or credit any overpayment to Deposit Account No. 07-1853. Should such additional fees be associated with an extension of time, applicant respectfully requests that this paper be considered a petition therefore.

Respectfully submitted,

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